

~~RAPIDLY~~ SELF - HEAT-CONDUCTIVE HEAT DISSIPATING MODULE

Background of the Invention

1. Field of the Invention

5 The present invention relates to a ~~rapidly~~ self - heat-conductive heat~~dissipating~~ module, and particularly to a heat dissipating module which can transfer heat effectively from the CPU of a computer or a device which ^{generates} ~~dissipating~~ a large amount of heat. The
10 present invention comprises a plurality of heatsinks which are overlapped, but ^{which} can be mechanically separated and ^{have} ~~are~~ discontinuous ~~in~~ contacting interface and a plurality of heat convection super~~conductive~~ tubes ^{made from} ~~containing~~ high temperature super~~conductor~~
15 composites .

2. Description of Prior Art

The heat dissipating devices for central processing units (CPUs) of computers or high heat generating devices
20 use heatsink devices with a plurality of metal fins to contact the heat sources, absorb heat and then transfer heat to the fins. Then heat-dissipating fans are used to blow cold air ^{to the} ~~for~~ dispersing heat.

The prior art is effective for heat ^a ~~from~~ a small CPU, ^{generating} ~~while~~ for CPU ^{the} ~~dissipating~~ a large amount of heat, it cannot
25 ~~not~~ operate effectively since the metal base of ^{the} heatsink, which contacts ^{the} heat source is spaced with the distal ends of the fins. Just by the way that heatsink base contacts the heat source (i.e. CPU), the heat from the base of
30 ^{the} heatsink can not be transferred to the distal ends of the

fins, and the root portions of the fins and the distal ends absorb unequal amounts of heat. In other words, the portion near ^{the} root of the base of ^{the} heatsink absorbs more heat, and the distal ends of ^{the} fins absorb much less heat.

5 As a result, the root is the only portion of the base of ^{the} heatsink used to dissipate heat. Therefore, ^{the} aforesaid conventional heat dissipating devices can not match the requirements of the newly developed CPUs with high operation speeds

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Summary of the invention

Accordingly, the primary object of the present invention is to provide a ~~rapidly~~ self-heat-conductive
15 heat ~~dissipating~~ module, wherein ^{the} ~~a~~ ~~rapidly~~ self-heat-conductive heat ~~dissipating~~ module has two heatsinks, ^a lower heatsink and ^{an} upper heatsink, which are overlapped ~~with fins facing fins, but can be mechanically separated and are discontinuous in contacting interface.~~

20 At least one heat convection super conductive tube ~~containing~~ ^{is} ~~containing~~ high temperature super conductor composite ~~are~~ engaged with the two heatsinks. A heat ~~dissipating~~ fan blows air ^{across} ~~to~~ the two heatsinks ^{to} ~~for~~ increasing ^{the} heat ~~dissipating~~ efficiency.

25 Another object of the present invention is to provide a ~~rapidly~~ self-heat-conductive heat ~~dissipating~~ module ^{with} ~~wherein~~ a plurality of ~~rapidly~~ self-heat-conductive heat ~~dissipating~~ modules having heatsinks which are overlapped, with fins facing ^{the} fins ^{The heatsinks are} ~~but~~ mechanically separable ^{ted} ^{have} and discontinuous ~~in~~ contacting interfaces ^{with} ~~and~~ a

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containing a plurality of heat convection super conductive tubes ~~made from~~ containing high temperature super conductor composites can be assembled together and then heat dissipating fan is used to blow cold air. Therefore, the rapidly self-heat-conductive heat-dissipating module can dissipate rapidly and efficiently.

The heat convection super conductive tubes are made of bendable metal tubes (for example, copper, aluminum, etc.) containing high temperature super conductor composites, such as yttrium barium copper oxide (YBCO) ~~superconductor material~~, thallium barium calcium copper oxide (TBCCO) ~~superconductor material~~, mercury barium calcium copper oxide (HBCCO) ~~superconductor material~~, bismuth strontium calcium copper oxide (BSCCO) ~~superconductor material~~, or other superconductor material, or other ~~rapid~~ heat conductive material. Two ends of the tube are closed ~~for~~ ^{to} preventing the superconductor material from draining out of the tube. Therefore, ^{the} heat convection super conductive tube is formed by aforesaid metal tube containing the superconductor material enclosed therein. The principle used is that when the molecules in the tube are heated, heat energy can be transferred by convection due to the rapid oscillation and large friction. Therefore, the heat can be transferred rapidly and it is called as a heat convection super conductive tube.

Since the heat transfer time in the heat convection super conductive tube from a hot end to a cold end is very short, the temperature difference between the hot end and the cold end is very small, and Thus an optimum heat

transfer can be acquired. It ^{should be noted} ~~has been appreciated~~ that the speed of heat transfer ^{is too} ~~is~~ about five times ~~of~~ that of copper. Furthermore, ^{the heat transfer} ~~it is~~ quicker than general extruded aluminum ~~heat dissipating~~ heatsinks.

5 As the temperatures ^{the} of hot end and ^{the} cold end of ^{the} heat convection super conductive tube ^{are} ~~is~~ very close, the temperature of the base of ^{the} lower heatsink, which engaged ^{the} with hot end of heat convection super conductive tube, is highest ~~in lower heatsink~~, and temperature of ^{the} top face 10 (base also) of ^{the} upper heatsink, which engaged ^{the} with cold end of ^{the} heat convection super conductive tube is highest ~~in the~~ ~~upper heatsink~~. Therefore, ^{the} temperature of ^{the} contacting interface between ^{the} lower heatsink and ^{the} upper heatsink will be the lowest. ~~Upwards~~ From the contacting interface, 15 temperature rises continuously ^{toward the} ~~till~~ top face of ^{the} upper heatsink. ^{The} The direction of heat flow in upper heatsink is downward. If the structure ^{has a} ~~is~~ continuous ~~in~~ contacting intrface between ^{the} lower heatsink and ^{the} upper heatsink, the downward heat flow of ^{the} upper heatsink will impair heat 20 dissipating ^{the} of lower heatsink, and heat dissipating ^{the} of CPU will be impaired ^{overall} ~~finally~~. In the present invention, ^{the} lower heatsink and ^{the} upper heatsink are mechanically separated and discontinuous ^{at the} ~~in~~ contacting ~~ing~~ interface.

The various objects and advantages of the present 25 invention will be more readily understood from the following detailed description when read in conjunction with the appended drawings.

Brief Description of the Drawings

Fig. 1 is an exploded perspective view of the ~~rapidly~~ self-heat-conductive heat/dissipating module of the present invention having two heatsinks and a plurality of
5 U- shaped heat convection super conductive tubes.

Fig.2 is a perspective view showing ~~that~~ the elements of Fig.1 ~~are~~ assembled ^{with} and a heat dissipating fan ~~is~~ ~~further~~ installed.

Fig.3 is an exploded perspective view of the ~~rapidly~~ self-heat-conductive heat/dissipating module of the present invention, wherein fins of two heatsinks are alternatively ^{ed} ~~arranged~~, with a plurality of U-shaped heat convection super conductive tubes and a heat dissipating fan being used.
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Fig.4 is a perspective view showing ~~that~~ the elements of Fig.3 ~~are~~ assembled.
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Fig.5 is ^{on} ~~the~~ exploded perspective view of the present invention, wherein two double U-shaped heat convection super conductive tubes and two heatsinks ~~is~~ are assembled.

Fig.6 is a perspective view showing ~~that~~ the elements of Fig. 5 ~~are~~ assembled.
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Fig.7 is a perspective view showing ^{a pair of} ~~that, with each~~ heatsink ^{each} ~~sets~~ being formed by two heatsinks, two heatsink sets ~~are~~ assembled ^{with the} ~~together~~ into one composite ~~rapidly~~ self-heat-conductive heat/dissipating module of the present invention.
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Detailed Description of the Preferred Embodiments

Referring to Fig.1, the ~~rapidly~~ self-heat-conductive
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heat-dissipating module of the present invention ~~is~~
~~illustrated.~~ The ~~heat-dissipating module~~ has ^aheatsink 1,
^aheatsink 2 and a plurality of heat convection super-
conductive tubes 3.

5 In the present invention, there are two heatsinks
which are mechanically separated and discontinuous in
structure.

Fig. 1 shows the first embodiment of the present
invention. ~~There are heatsink 1 and heatsink 2.~~ Heatsink
10 1 has a plurality of fins 11 connected ^{to}~~on~~ the base 10. ~~Heatsink~~
Heatsink 2 has a plurality of fins 21 connected ^{to}~~on~~ the
base 20. Base 10 of heatsink 1 has a plurality of
trenches 12, ^{and} base 20 of heatsink 2 (top face of upper
heatsink) has a plurality of trenches 22. The heat
15 convection superconductive tubes 3 are bent to have a U
shape. Lower sections 31 (hot ends) of the U-shaped tubes
3 are placed in trenches 12, upper sections 32 (cold ends)
of ^{the}U-shaped tubes 3 are placed in another ^{set of}trenches 22.
Heatsink 1 and heatsink 2 are assembled as one set.
20 ~~Meanwhile,~~ the heat convection superconductive tubes 3
have the effect of buckling two heatsinks (referring to
Fig. 2). The bottom of the base 10 of the heatsink 1
with lower sections 31 (hot ends) of the U-shaped tubes
3 serves ^{to}~~for~~ contacting a heat source, such as ^aCPU.
25 Therefore, ^alarge amount of heat can be transferred to
heatsink 2 through the heat convection superconductive
tubes 3.

The reason for using two heatsinks ^{that are} mechanically
separated and discontinuous ^{at the}~~in~~ contacting interface is

that no convection between ^{the} upper heatsink 1 and ^{the} lower heatsink 2 occurs, since the upper heatsink 1 and lower heatsink 2 are separated, and thus no heat ^{passes between them} returns.

Since the heat transfer time in the heat convection
5 super conductive tube from a hot end 31 to a cold end 32 is very short, the temperature ~~of~~ difference between the hot end 31 and the cold end 32 is very small. As the temperatures of ^{the} hot end 31 and ^{the} cold end 32 ^{are} very close, the temperatures of ^{the} lower base 10 and ^{at the} upper base 20 will
10 be ~~the~~ highest, and ~~the~~ temperature ^{at the} of contacting ^{inter} face between heatsink 1 and heatsink 2 will be the lowest.

^{4 moving} ~~upwards~~ from the contacting ^{inter} face, temperature rises continuously ^{toward} ~~till~~ upper base 20. ^{The} direction of heat flow in heatsink 2 is downward. If the structure ^{of the contacting interface} is continuous
15 between heatsink 1 and heatsink 2, the downward heat flow of heatsink 2 will impair heat dissipating of heatsink 1, and ^{the} heat dissipating of ^{the} CPU ^{overall} will be impaired ~~finally~~.

In the present invention, heatsink 1 and heatsink 2 ^{are} ~~are~~ ^{whole} mechanically separated and discontinuous ~~in~~ contacting
20 interface. Therefore, a ~~rapidly~~ self-heat-conductive heat-dissipating module is formed by the heat convection super conductive tubes 3 containing high temperature super conductor composites, heatsink ¹ and heatsink ² ¹⁰
~~which are mechanically separated and discontinuous in~~
25 ~~structure.~~

A heat dissipating fan 4 is assembled at the ~~identical lateral~~ side of the two heatsinks ^{to} for blowing cold air to the fins 11 and ^{the} fins 21 to achieve a high efficiency heat dissipation.

Fig.3 shows ^a ~~the~~ second embodiment of the present invention ~~is illustrated~~. ~~There are~~ heatsink 1 and heatsink 2, ~~which~~ are mechanically separated and discontinuous in structure. Base 10 of the heatsink 1 has a plurality of trenches 12, ^{and} base 20 of the heatsink 2 has a plurality of trenches 22. The heat convection super conductive tubes 3 are bent to have a U shape. ~~Two~~ ^{the two} ends of the U-shaped tubes are placed in trenches 12 and trenches 22.

10 Heatsink 1 and heatsink 2 are assembled as one set, and the fins of the two heatsinks are alternatively arranged. The alternatively arranged fins ~~can~~ increase the area of heat dissipation.

~~Meanwhile,~~ The heat convection super conductive tube 3 has the effect of buckling two heatsinks (referring to Fig. 4). The base 10 of the heatsink 1 with trenches 12 serves ^{to} ~~for~~ contacting a heat source. Therefore, ^a large amount of heat can be transferred to heatsink 2 through the heat convection super conductive tube 3. ~~The~~ heat is thus transferred to each heatsink. A heat dissipating fan 4 is assembled at the ~~identical lateral~~ side of the two heatsinks for blowing cold air to the fins 11 and fin 21 to achieve a high efficiency heat dissipation.

Fig.5 shows ^a ~~the~~ third embodiment of the present invention. In this ^{embodiment} ~~the present invention~~, the heatsinks are identical to those in the first embodiment, which are mechanically separated and discontinuous in structure.

There is ^a difference between ^{the} heat convection super conductive tubes of Fig.1 and Fig.5. ^{In the third embodiment (Fig. 5), there} ~~There are~~ two heat convection super conductive tubes 53 and 54. Both are

formed by two U shapes.

5 ~~A first of the~~ ^{One} heat convection superconductive tube 53 is wider ^{than} ~~a second tube~~ and the other 54 is narrower. The two free ends 531, 532 of the double U shapes of the wider heat convection superconductive tube 53 ^{are} ~~can be~~ placed in the two trenches 121, 124. The ^{inner} ~~portions of double U shapes~~ ^{533, 534} of the wider heat convection superconductive tube 53 ~~having no free end~~ ~~533, 534~~ are placed in the two trenches 221, 224.

10 The two free ends 541, 542 of the double U shapes of the narrower heat convection superconductive tube 54 are placed in the two trenches 122, ~~123~~ at the inner sides. The ^{inner} ~~portions of double U shapes~~ ^{543, 544} of the narrower heat convection superconductive tube 54 ~~having no free end~~ ~~543, 544~~ are placed in the two trenches 222, 223 ~~at the~~ ^{inner} sides.

15 Therefore, in addition to transferring through the fins 11, the heat absorbed by the base 10 can be transferred to the heatsink 2 through the heat convection superconductive tubes ~~rapidly~~.

20 Fig. 6 shows a heat dissipating fan 4 ~~is~~ assembled at the ~~identical lateral~~ side of the two heatsinks 1, 2 ^{to} ~~for~~ blowing cold air to the fins 11, 21 to achieve a highly efficient heat dissipation.

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Fig. 7 shows ^a ~~the~~ fourth embodiment of the present invention. In this embodiment, the heatsink sets 71, 72 and the heat convection superconductive tubes 3 ^{are} ~~can be~~ assembled together.

30 The ~~rapidly~~ self-heat-conductive heat ~~dissipating~~

module of the present invention has the following advantages:

1. Heatsinks of ~~rapidly~~ ^{the} self-heat-conductive heat/dissipating module of the present invention are mechanically separated and discontinuous in structure, ~~and heat of heatsink contacting~~ ^{so that heat from the} heat generating device can dissipate more rapidly.

2. The adoption of heat convection super conductive tubes containing high temperature super conductor composites make ~~heat of heat generating device~~ dissipate more rapidly.

3. In the present invention, a plurality of ~~rapidly~~ self-heat-conductive heat/dissipating modules can be assembled ~~integrally~~, the heat from the heat source ~~can dissipate more rapidly.~~ ^{therefore} ~~can~~ ^{even} dissipate more rapidly.

4. The alternatively arranged fins ~~make~~ ^{increase the heat} dissipating area ~~increase and heat dissipate more rapidly.~~

The present invention ~~are thus~~ ^{having been} described, it will be obvious that modifications and variations may be easily made without departing from the spirit of this invention ~~which is defined by the appended claims.~~ Such modifications and variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications and variations as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

ABSTRACT OF THE DISCLOSURE

A ~~rapidly~~ self-heat-conductive heat-dissipating module ^{that includes} ~~is disclosed including:~~ a plurality of heatsinks which are overlapped, but ^{are} ~~mechanically~~ ^{ted} separable and discontinuous ^{ata} ~~in~~ contacting interface ^{the module includes} ~~at least one~~ heat convection super-conductive tubes containing ^{and} ~~high~~ temperature super-conductor composites ^{at} ~~at least one~~ heat dissipating fan ^{assembled to an identical lateral} ~~side of the heatsinks. In addition to serving to buckle~~ heatsinks together, ^{the} ~~heat convection super-conductive~~ tubes containing high temperature super-conductor composites transfer heat to heatsink far away from heat generating source rapidly, whereby efficiency of heat dissipating ^{from} ~~increases~~. Mechanical separability between ^{connected} ~~buckled~~ heatsinks and discontinuity in ^{the} ~~contacting~~ interface between heatsinks ^{mirrors} ~~avoid~~ heat dissipation ^{by} ~~of~~ the heatsink contacting heat source being impaired by the downward heat flow from heatsink far away from heat source. Heat dissipating fans assembled to an identical lateral side of the heatsinks blow cold air to fins of heatsinks to increase heat-dissipating efficiency. ^{the} ~~pins~~ of contacting heatsinks can be arranged alternatively to increase heat-dissipating efficiency. A plurality of heatsink sets can be assembled together to form a composite ~~rapidly~~ self-heat-conductive heat-dissipating module ~~to further enhance heat-dissipating efficiency.~~ ~~All characteristics of the present invention mentioned above make rapidly self-heat-conductive~~ heat-dissipating module of the present invention a

~~highly efficient heat-dissipating device.~~